THE ELEOTRID GOBIES OF THE PHILIPPINES AND ADJACENT REGIONS

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The gobies are small and usually inconspicuous fishes of no direct importance in most parts of the world. In the Philippines and East Indies they are of much economic importance in certain regions, particularly in northern Luzon.

The gobies are the largest group of fishes in oriental tropical waters, with more than 235 species known from the Philippines alone. This large number, which will be increased with further exploration of Philippine waters, is distributed among six families and the bulk belong to the Gobiidæ or true gobies and the eleotrids or family Eleotridæ.

All gobies invariably have ventral fins on the thorax, each with a spine and five, or very rarely four or three, soft rays. The ventrals are very close together, the inner rays longer than the outer ones. In most of the gobylike fishes the ventrals are completely united to form a single fin, as in the well known *biang puti*. In the Eleotridæ the ventrals are more or less disconnected, and are never united with a frenum or membrane across the base to convert them into a vacuum cup or sucking disk with strong adhesive powers. They are, however, near enough together so that they are used for clinging to rocks, sticks, or other objects in the water or on the bottom of a stream or pool.

The spinous dorsal is short, nearly always of six feeble spines, very rarely fewer or more. The soft dorsal is always longer, a spine and with from 8 to 32 rays. The anal is opposite the soft dorsal and very similar, with a spine and 7 to 32 rays. The dorsals are separate or may be united only at the base. Ventrals with a spine and usually five rays; rarely there are but four or three.

As in all gobies there is no lateral line. The scales may be ctenoid or cycloid, wholly so or part of the body with one kind and part with the other. In some kinds the body is wholly naked, or largely so. The number of scales varies from 22 to 170. The body is more or less elongate, cylindrical or laterally compressed. There are from four to six branchiostegals. In some genera one or more of these may end in a prominent sharp forward-projecting point. An air bladder is present in most eleotrids.

Eleotrids are abundant in Philippine, East Indian, and southeastern Asiatic waters, especially in shallow bays, inlets, river mouths, and the lower reaches of fresh-water streams. Some of them are exclusively marine, but the largest and economically most important ascend rivers and enter lakes, and go far beyond influence of the tides. Some kinds go upstream into the mountains, as long as they are not stopped by waterfalls or dams. When mature, they go back downstream to brackish water or to the sea and spawn. The fry of these migratory species enter the mouths of rivers in dense schools. They are caught then in great quantities, and are eaten fresh but most of them by far are made into *bagoong* or *guinamos,* called *belachan* in Malay.

Most eleotrids are plainly colored, usually brown or dusky and inconspicuous, but a few species, especially some of the coral reef inhabitants, are brilliantly or handsomely colored.

One of the eleotrids, *Ophiocara aporos,* called *bañgañgay* and *palowon* in Tagalog, is the handsomest fresh-water fish of the Philippines. It is the only gorgeously colored fish living in the muddy dark waters of Philippine lowland streams. In life the general effect is dark green and gold. No two fish are exactly alike. There are usually two irregular rows of large golden spots connected by cross bars along the sides. Two dark green stripes are present from the eye to the edge of the preopercle, and another crosses the opercle and cuts in two a large golden spot on the pectoral base. Often there are also red or orange spots on the sides, and the dark green of the body may be pale green or even electric blue. Sometimes the head stripes are lavender and there may be violet or lavender marks on the sides and caudal fin. The soft dorsal has large golden spots, often on a blue or green membrane.

Many of the eleotrids are able to change their color to a remarkable degree, according to the character of the background and the amount of light. By changing their color and its pattern they can hide successfully without moving from their positions.

In addition to the use of the fry, the adults of the larger eleotrids are caught for food. The larger species are robust thick-bodied fishes and are good eating. They are commonly seen in Philippine, Bornean, and Malayan markets, and are often kept alive to ensure their being perfectly fresh.

This paper does not contain descriptions, but is offered as a means for the ready identification of the eleotrid gobies now known from the Philippines and East Indian area. The keys used are simple and practical. Lengths given are the standard length, measured from the tip of the snout to the last vertebra of the backbone; the tail is not included.

Key to the genera of Eleotridæ in the Philippines and tropical Western Pacific

I. Head armed.
  A. Angle of preopercle armed.
    B. With a single stout curved spine or else with 3 to 6 teeth or short spines at the preopercular angle .... 1. *Asterropteryx.*
    BB. With a downward curved sharp spine, sometimes hidden and hard to find .... 2. *Eleotris.*
  AA. Angle of preopercle not armed; one or two branchiostegals end anteriorly in a sharp spine pointing forward and upward; head naked; upper pectoral rays loose flossy, silklike 3. *Belobranchus.*
II. Head not armed.
  C. Resembling cyprinid fishes, the head and body laterally compressed. 4. *Hypseleotris.*
  CC. Species typically gobiiform.
    D. Teeth on vomer.
      E. A patch of small teeth on the head of the vomer: body covered with very small cycloid scales 130 to 150......... 5. *Bostrichthys.*
      EE. Two large teeth set transversely on vomer.
        F. Teeth fused to form a unit; scales cycloid, 150 to 160; dorsal and anal rays 24 to 30 .... 6. *Gracileotris.*
        FF. Vomerine teeth distinctly two but fused to form a low ridge; scales ctenoid, 60 to 75; dorsal and anal rays 10 to 16. 7. *Zebreleotris.*
    DD. No teeth on vomer.
      G. Head large, blunt, about twice in trunk; snout and cheeks with many rows of skinny papillate ridges; no canines; mouth strongly oblique, posterior scales ctenoid, the rest cycloid. 8. *Gobiomorphus.*
      GG. Head without conspicuous rows of cutaneous papillate ridges.
        H. Head with bony crests, either serrated or smooth.
          I. Scales on sides ctenoid and less than 50.
            J. Scales 26 to 30; first dorsal with 6 spines.
              K. Head very long, pointed, prismatic, its height equal to its breath; lower jaw very prominent.... 9. *Butis.*
              KK. Head very short, obtuse, wider than deep, the lower jaw scarcely projecting; crests strongly elevated and serrate .... 10. *Prionobutis.*

JJ. Scales on sides 36 to 46; first dorsal VI to VIII, usually VII .... 11. *Odontobutis*.

II. Scales on sides cycloid, 80 to 100; 2 curved canines in upper jaw and 4 in lower jaw.......... 12. *Odonteleotris*.

HH. No bony crests on head.

L. Head large, broad, depressed; lower jaw prominent.

M. First dorsal with 4 or 5 spines.

N. First dorsal IV or V; second dorsal I–7; scales ctenoid, 55 in lateral series; 36 predorsal cycloid scales; 8 or 10 rows of minute teeth in each jaw .... 13. *Lizettea*.

NN. First dorsal V; second dorsal I–10; all scales cycloid, 85 to 100 in lateral series; 55 to 65 predorsal; outer teeth enlarged with several rows of small teeth behind .... 14. *Paloa*.

MM. First dorsal with 6 spines.

O. Snout and cheeks with many short filaments; scales ctenoid with many accessory scales; head broad, depressed; teeth villiform; outer row above enlarged; lower jaw with an outer and an inner row of larger teeth. 15. *Pogoneleotris*.

OO. Snout and cheeks without filaments; scales in lateral series 30 to 70; predorsal scales 13 to 65.

P. Four rows of teeth in each jaw, the outer and inner rows enlarged; scales all cycloid, or those on sides ctenoid, 50 to 70 in a lateral series; predorsal scales 30 to 42.... 16. *Boroda*.

PP. Six to ten rows of small to minute teeth in each jaw; no canines.

Q. Head blunt, snout broad.

R. A broad naked furrow above eye, separated from it by a single row of small scales; 52 to 60 ctenoid scales in a lateral series; other scales all cycloid, predorsal 42 to 46; second dorsal and anal much higher than first dorsal .... 17. *Bunaka*.

RR. Furrow above eye, when present, not separated by a single row of scales.

S. Scales in lateral series 28 to 40; predorsal 13 to 26, those on top of head conspicuously enlarged .... 18. *Ophiocara*.

SS. Scales all cycloid, 85 to 90 in lateral series; predorsal scales very small and crowded; vertical fins all low, the first dorsal lowest; eye superior, noticeably small, 11.5 to 12 times in length of head .... 19. *Gigantogobius*.

QQ. Head pointed, snout narrow; scaled above and on sides; scales all ctenoid, 45 to 100 in lateral series; predorsal scales 26 to 65; no canines; soft dorsal rays 9 to 12; anal rays 7 to 10........ 20. *Oxyeleotris.*

LL. Head not noticeably large, broad, and depressed.

T. Dwarf fishes, adults not exceeding 30 mm, as far as known.

U. Ventrals I–3.

V. Body naked; second dorsal I–13 to 18; anal I–12 to 18 .... 21. *Herreolus.*

VV. Scales cycloid, 75 to 100 in lateral series; second dorsal and anal I–15 to 18. 22. *Andameleotris.*

UU. Ventrals 1–4, long, narrow, with fringed rays; scales ctenoid, 22 to 28 in longitudinal series .... 23. *Eviota.*

UUU. Ventrals I–5; scales cycloid anteriorly, ctenoid behind tip of pectoral, 48 to 50 in lateral series..................... 24. *Luzoneleotris.*

TT. Adult fishes more than 30 mm long; scales 60 to 170 in lateral series; ventrals of ordinary shape.

W. Ventrals I–5.

X. Scales all ctenoid.

Y. Eye usually much less than snout, rarely equal to it; lateral scales 70 to 130; head naked; predorsal scales few or none; lower jaw with a pair or several pairs of canines .... 25. *Valenciennea.*

YY. Eye more than snout; lateral scales about 64; predorsal scales 15 to 20, head otherwise naked 2 pairs of canines above, 1 pair in lower jaw; ventral and caudal both longer than head. 26. *Pteroculiops.*

XX. Anterior scales cycloid, posterior scales ctenoid, 80 to 85 in lateral series; no predorsal scales; 3 pairs of canines in lower jaw; dorsal and anal rays 12 to 13 .... 27. *Amblyeleotris.*

XXX. Scales 100 to 110, cycloid (?); ventral equals head; snout 5 in head, much shorter than eye, which is 3 in head; first dorsal spine threadlike, reaching base of last second dorsal ray; no canines; dorsal rays 28; anal rays 24 .... 28. *Nemateleotris.*

WW. Ventrals I–4; mouth oblique to nearly vertical, with prominent chin.

Z. Scales cycloid.
  a. No barbels on chin.
    b. Caudal broadly rounded; scales 160 to 170; second dorsal and anal rays 10; eye 2 in snout; upper jaw with a pair of median canines behind other teeth .... 29. *Parviparma.*
    bb. Caudal lunate; scales 100 to 170; second dorsal and anal rays 24 to 32; eye equal to or more than snout; lower jaw with a pair or several pairs of canines.... 30. *Ptereleotris.*
  aa. One or more barbels on chin.
    c. Chin with single median barbel; dorsal rays 28; anal rays 26; caudal truncate, equals head; eye more than snout; scales minute, partly embedded; no canines. 31. *Pogonoculius.*
    cc. Chin with flat median barbel head, upper and lower rays hind it; caudal longer than head, upper and lower rays forming long filaments; lower jaw with 2 large canines 2. *Vireosa.*
ZZ. Scales ctenoid, body compressed, mouth nearly vertical; 4 canines in each jaw.
  d. Scales small, extending forward to eyes; caudal bluntly convex; second dorsal and anal rays 25 to 30 .... 33. *Orthostomus.*
  dd. Scales deciduous; about 100 to 110 in lateral series; caudal elongate, pointed, the central rays threadlike; soft dorsal and anal rays 30 to 32; head compressed above into a fleshy scale crest......... 34. *Oxymetopon.*

1. Genus ASTERROPTERYX Ruppell

The laterally compressed short and deep body is covered with large ctenoid scales, which are also on the sides of the head.

It is separated from other eleotrids by having the angle of the preopercle armed. The armature may be a single long spine or may be stout teeth or spines, 3 to 6 in number. Scales 24 to 28; dorsals close together, VI–I–9 to 11; anal I–8 to 11. Small fishes not exceeding 40 mm in length. Species few.

Key to the Indo-Pacific species

A. Three to 6 stout teeth or short spines at the preopercular angle.
  B. Scales in lateral series 27 or 28; body pale olive brown; a small black shoulder spot .... *A. everetti.*
  BB. Scales in lateral series 24; body with blackish brown cross bands or blotches; in life each scale with a brilliant blue spot. *A. semipunctatus.*
AA. A single long sabrelike spine at the angle of the preopercle. *A. ensifer.*

DISTRIBUTION OF THE SPECIES OF ASTERROPTERYX

ASTERROPTERYX EVERETTI Boulenger.

This Philippine species is only known from the original collections in Balabac and in Palawan.

ASTERROPTERYX SEMIPUNCTATUS Ruppell.

This lovely little gemlike fish occurs throughout the tropical Indo-Pacific. It was first described from the Red Sea but extends eastward through the East Indies and Philippines to the Pelew, Samoan, Society, and Tuamotu islands. On some coral reefs they are excessively abundant, hundreds occurring on a few square meters. In the Philippines they are found on every coral reef, and are particularly common from Cebu southward. The largest are probably less than 50 mm in length.

ASTERROPTERYX ENSIFER Bleeker.

This singular and apparently very rare little eleotrid, with its great swordlike spine, was first known from Buru, an East Indian Island. Then three more were obtained in the Postillon Islands, also in the East Indies. Four were taken near Jolo, and a couple more at Bongao, Sulu Province. This eleotrid lives in and under great coral heads, so that it is very seldom seen.

Asterropteryx monacanthus Regan, from the Seychelles Islands, Indian Ocean, is apparently the same fish.

2. Genus ELEOTRIS Block and Schneider

The species of this genus have a thick and robust body and some of them reach a length of a fourth of a meter. However most specimens are small and the largest Philippine specimens thus far known do not exceed a length of 150 mm.

All members of this genus are easily recognized by the presence of a hard, sharp, downward-curved spine at the lower angle of the preopercle. Sometimes it is difficult to make out, but usually it is readily observed and living fish are able to make wounds with their spine.

The members of this genus are of economic importance, especially in northern Luzon. At certain times the fry are abundant in shallow bays and inlets, and great shoals of tiny fish enter estuaries and river mouths and begin their ascent of streams. They are then taken in great quantity and used for making *bagoong*, although many are eaten fresh.

In addtion to the species of *Eleotris* listed here, other species have been reported from New Guinea, but their true generic affiliations are not clear. In the absence of material for study to settle the matter it is best to omit them.

Key to the Philippine and East Indian species of Eleotris.

A. Scales in lateral series 58 to 65; predorsal scales 48 to 50; scales from second dorsal origin to anal origin 16 to 19................. *E. fusca.*

AA. Scales in lateral series 42 to 55.

  B. 14 or 15 scales in transverse series from the second dorsal origin to the anal origin; 47 to 55 scales in lateral series.

    C. 10 to 12 scales across the middle of the caudal peduncle; scales of caudal peduncle not larger than those on middle of side; no scales on snout.

      D. A wide dusky strip from head to caudal along middle of side; small black dots scattered on stripe and below it........ *E. balia.*

      DD. No stripe or dots as above.

        E. Head 3 to 3.2 in the length; teeth nearly uniform, or those of the outer row above a little larger............ *E. melanosoma.*

        EE. Head less than 3 in the length; the outer and inner rows of teeth in both jaws larger than the others. *E. macrocephalus.*

    CC. 8 scales across the middle of the caudal peduncle; scales of peduncle much larger than those on middle of trunk; teeth and length of head as in *E. macrocephalus*........ *E. oxycephalus.*

  BB. 11 or 12 scales from second dorsal origin to anal origin; 8 or 9 scales across middle of caudal peduncle; head 3 or more than 3 times in the length; scales on caudal peduncle not or scarcely larger than those on middle of trunk.

    F. About 50 scales in a longitudinal series; depth about 6 to 7 in length, including the tail..................... *E. insulindicus.*

    FF. 42 to 45 scales in lateral series; depth 5 times in length, including the tail .... *E. macrolepis.*

ELEOTRIS FUSCA (Bloch and Schneider).

This dark colored and retiring fish, known as *mulug*, occurs in streams near the sea and in swamps from Pangasinan

Province southward throughout the Philippines. It hides among stones or lies on the bottom where its color blends with its background so that it can hardly be seen. It also hides under grasses and masses of roots along the banks of streams and in ponds and thus escapes observation.

The *mulug* begins to spawn when only 36 mm long, but may reach a length of 275 mm, though such large examples are not yet recorded from the Philippines.

The *mulug* occurs from the streams along the East coast of Africa and from Madagascar to India, the East Indies, the Hawaiian and Society islands. It extends northward along the China coast to the Riu Kiu Islands.

ELEOTRIS BALIA Jordan and Seale.

This species is only known from the coasts of central and southern China and the island of Hainan. It may well occur on the Ilokano coast and among the Batanes Islands. It attains a length of about 175 mm.

ELEOTRIS MELANOSOMA Bleeker.

This is the well-known *virot* of the Ilokano provinces. The fry are one of the principal sources of *bagoong* in the north of Luzon. The *virot* does not have the wide range of the *lamug*. It is abundant in the northern half of Luzon, but is not so plentiful in the southern part of the Islands. Elsewhere it occurs from Sumatra to New Guinea and New Caledonia. In appearance and habits it agrees with the *mulug*.

This little eleotrid probably never exceeds a length of 125 mm.

ELEOTRIS MACROCEPHALUS Bleeker.

This rare species is only known from Amboina and Buru.

ELEOTRIS OXYCEPHALUS Bleeker.

This species occurs on the coasts of Japan, China, the East Indies, and Australia, and should be in the Philippines. It reaches a length of 230 mm or more. No doubt it is confused with the *virot*.

ELEOTRIS INSULINDICUS Bleeker.

This eleotrid is widely distributed in the East Indies, where it is found in river mouths. It is another small fish, perhaps never more than 120 mm long.

ELEOTRIS MACROLEPIS Bleeker.

This species is known only from Amboina. The two specimens were 70 and 81 mm in length.

3. Genus BELOBRANCHUS Bleeker

This unique genus is recognized by the following characters:—the head is naked; the upper pectoral rays are free and silklike; and the first branchiostegal ends in a sharp spine pointing forward and upward. Sometimes the first and second branchiostegals both end in a forward-pointing spine. No other eleotrid has such a combination of characters.

But one species is known, confined to the rivers and estuaries of the East Indian region. Growth stages and color phases have been described as separate species, but of course were not valid.

BELOBRANCHUS BELOBRANCHA (Cuv. and Val.).

This attractive fish, with handsomely spotted fins and plump, robust, form, has been reported from the hill streams of Luzon, Alabat, Mindoro, Negros, and Mindanao. With this known distribution it is evident that it lives in the rivers of all the larger islands in the Philippines. It reaches a length of 180 mm or more, and is much esteemed for food by the people living along hill streams.

It is known from the East Indian islands of Bali, Batjan, Borneo, Celebes, and Ceram. Again, this distribution shows that it must occur generally in the hill streams throughout the East Indies.

4. Genus HYPSELEOTRIS Gill

In the Philippines and East Indies.

These are free swimming fresh-water fishes in the Philippines and East Indies, but one from the Society Islands is marine. The following key gives those thought to be in the East Indian region.

A. Head with stripes.
  B. Two brown stripes from eye across cheek to operculum; 25 scales in lateral series .... *H. agilis.*
  BB. A brown stripe from eye to throat; 28 scales in lateral series. *H. tænionotopterus.*
AA. No crossbands or diagonal stripes on head.
  C. A black longitudinal band on lower half of body........ *H. güntheri.*
  CC. No black longitudinal band along side.
    D. 25 scales in a longitudinal series; pectoral with a double black and yellow basal spot .... *H. leuciscus.*
    DD. 26 to 29 scales (usually 28) in a longitudinal series; a dark crossbar on pectoral base.
      E. A blackish line along middle of side; anal papilla large, very broad and long, with notched tip.

F. 15 predorsal scales; caudal truncate with rounded corners, much shorter than head .... *H. pangel.*

FF. 17 to 19 predorsal scales; caudal equal to head, with elongate pointed tip .... *H. quisumbingi.*

EE. No black line along middle of side.

G. Color in alcohol uniform; brown spot on lower half of caudal base; genital papilla small, slender; second dorsal and caudal faintly barred with brown or black. *H. modestus.*

GG. Color in alcohol blackish or brownish grey, a conspicuous black spot or vertical bar on caudal base; genital papilla long, with lunate tip; caudal clear or golden; males with second dorsal deep black with circular white spots .... *H. bipartita.*

DISTRIBUTION OF HYPSELEOTRIS IN THE PHILIPPINES AND EAST INDIES

HYPSELEOTRIS AGILIS Herre.

Occurs in Mindanao, Mindoro, and Luzon.

HYPSELEOTRIS BIPARTITA Herre.

As yet this little fish has only been found in Albay Province, Luzon.

HYPSELEOTRIS GÜNTHERI (Bleeker).

Reported from Negros Oriental under the name of *H. cyprinoides.* True *H. cyprinoides* is only known positively from the island of Reunion, in the Indian Ocean. *H. güntheri* ranges over the tropical Pacific, from Kusaie in the Carolines to Samoa, Fiji, and New Caledonia.

HYPSELEOTRIS LEUCISCUS Bleeker.

This species is only known as yet from Sumatra.

HYPSELEOTRIS MODESTUS (Bleeker).

This species has been found in Mindoro, Leyte, and Palawan, and no doubt occurs throughout the central Philippines.

Bleeker's specimens were from Singapore and Sumatra.

HYPSELEOTRIS PANGEL Herre.

This species occurs in Cavite Province, Luzon, and probably all over central and southern Luzon.

HYPSELEOTRIS QUISUMBINGI Roxas and Ablan.

Only known from market specimens at San Fernando, La Union Province, Luzon.

HYPSELEOTRIS TÆNIONOTOPTERUS (Bleeker).

Recorded only from Bali.

5. Genus BOSTRICHTHYS Dumeril

Characterized by a patch of teeth on the vomer. Only 2 species of this genus are known, one of wide distribution, the other only known from New Guinea.

Key to the species of Bostrichthys

A. A large white-margined ocellus or eye spot on the caudal base; dorsal VI–I–12 or 11; anal 1–8 or 9; scales 130 to 140; body brown or mottled, but without crossbands .... *B. sinensis.*

AA. No ocellus on the caudal base; dorsal IX or X–I–16 or 17; anal I–12; scales 150; body with 8 or 9 dark brown crossbands........ *B. zonatus.*

BOSTRICHTHYS SINENSIS (Lacépède).

In the Philippines this eleotrid, so readily recognized by the large ocellus or "eye-spot" at the base of the tail, is known from Manila Bay, Mindoro, Romblon, Cebu, Busuanga, Mindanao, and the Sulu Archipelago and no doubt is found on all our coasts. First described from the southern coast of China, it is known from the Andaman Islands through the East Indies and Melanesia to Fiji, and east of the Philippines to Kusaie, in the Carolines.

It reaches a length of over 200 mm.

BOSTRICHTHYS ZONATUS (M. Weber).

This species is only known from Merauke, New Guinea. It reaches a length of 150 mm.

6. Genus GRACILEOTRIS Herre

This genus is distinguished by the presence of two large teeth set transversely on the vomer, but fused to form a single incisorlike tooth. The scales are cycloid, 150 to 160 in lateral series, the sides of the head and the predorsal area naked. Dorsal and anal rays each 24 to 30. Fins all low, the caudal a little longer than the head and more or less lunate, its upper and lower rays elongate. The dorsal and anal rays are all simple.

Type of the genus *Gracileotris bockensis* Herre.

GRACILEOTRIS BOCKENSIS Herre.

Thus far this is only known from Bock Island, on the outer reef of Rongerik Atoll, in the Marshall Islands.

This species reaches a length of about 80 mm.

7. Genus ZEBRELEOTRIS Herre

This genus has a low ridge across the vomer, formed of two distinct teeth, and covered with a velum. Dorsal VI–I–10 to 16; anal I–10 to 14; ventral I–4. There are 60 to 75 rows of ctenoid scales in a longitudinal, and 20 to 26 rows in a transverse series; predorsal scales extend halfway to the eyes; cycloid scales on the pectoral base and preventral area; the head is naked. One or two pairs of canines anteriorly in the upper jaw, 2 pairs of canines in the lower jaw.

Type of the genus *Zebreleotris fasciata* Herre.

ZEBRELEOTRIS FASCIATA Herre.

Only known as yet from Bikini Island, Bikini Atoll. It reaches a length of about 60 mm.

8. Genus GOBIOMORPHUS Gill

Small, stout, short-bodied eleotrids with large scales, rows of skinny papillate ridges on the head, and no teeth on the vomer. Several species occur in Polynesia, Australia, New Zealand, and the East Indies. Two species are known from the Philippines.

Key to the Philippine species of Gobiomorphus

A. Anterior half of body with cycloid scales, posterior half with ctenoid scales; 10 scales, between second dorsal and anal origins.... *G. illotus.*

AA. All scales on trunk ctenoid; 13 scales between second dorsal origin and anal origin .... *G. sclateri.*

GOBIOMORPHUS ILLOTUS Herre.

As yet this species is only known from Polillo. More material may show it to be but a variant of *G. sclateri.*

GOBIOMORPHUS SCLATERI (Steindachner).

This little reef dweller, which apparently never exceeds a length of 60 mm, occurs throughout the Philippines. In the East Indies it is known from Great Tobea and Tomahu Islands and is common in the New Hebrides, Solomons, Fiji, Samoan, and Society Islands.

9. Genus BUTIS Bleeker

East Indian fishes of salt, brackish, and fresh water living in bays and estuaries, and the lower parts of rivers near the sea. Five species are known from the tropical Indo-Pacific area, of which 3 occur in the Philippines. They are all small slender fishes, never exceeding 150 mm in length. The long pointed prismatic head with prominent bony crests is very distinctive.

Key to the Philippine and East Indian species of Butis

- A. Least depth of the caudal peduncle 1.9 to 3 times in its own length.
  - B. Scales of the trunk with basal accessory scales.
    - C. Maxillary not reaching eye or scarcely extending beyond anterior margin of eye; 2 or 3 rows of minute scales between eye and orbital ridge; outer row of teeth longer than those of the median

rows; scales ctenoid except on pectoral base and preventral area, which are cycloid; head 2.7 to 3 times in the length *B. butis.*

CC. Maxillary extending beneath middle of eye, teeth all approximately equal in size; all scales ctenoid; head 2.4 to 2.5 times in the length .... *B. melanostigma.*

BB. No basal or accessory scales on scales of trunk.

D. Interorbital, preopercle, and jaws covered with scales. *B. amboinensis.*

DD. Interorbital, preopercle, and jaws naked........ *B. gymnopomus.*

AA. Least depth of caudal peduncle 1.66 times in its own length; scales ctenoid, those of the head cycloid................................ *B. prismaticus.*

BUTIS BUTIS (Hamilton).

This little fish occurs from Cagayan Province, Luzon, to Davao, Mindanao, and Palawan in the Philippines. Originally described from the Ganges River, India, it ranges to the coast of China, and eastward through the East Indies to New Guinea.

BUTIS MELANOSTIGMA Bleeker.

This species is known only from Java, Madura, Sumatra, and Borneo. It probably occurs in the Philippines but has been confused with *Butis butis.*

BUTIS AMBOINENSIS Bleeker.

This small obscure fish, known as *biang sunog,* occurs throughout the Philippines in rivers near the sea. It was first described from Amboina, and is also known from Buru and Celebes. It occurs from the Andaman Islands in the Indian Ocean to New Guinea, the Solomon Islands, the Queensland, Australia.

BUTIS GYMNOPOMUS Bleeker.

In the Philippines this fish is known from Luzon, Mindoro, Panay, and Leyte, and no doubt occurs throughout the Islands. In the East Indies it has been recorded from Sumatra, Nias, Singapore, Banka, Java, and Borneo, and I collected it at Kulambangra Island, one of the Solomon Islands.

BUTIS PRISMATICUS Bleeker.

This species is only known from the vicinity of Surabaya, Java.

BUTIS DASYRHYNCHUS (Günther).

This fish is only known from the rivers of western Borneo. I have seen neither description nor specimens.

10. Genus PRIONOBUTIS Bleeker

This genus is separated at once from its relatives in the genus *Butis* by its teeth and the shape of its head and body. Only two species are known;

A. Eyes 4 to 4.5 times in the length of the head, the concave space between them less than an eye diameter; maxillary extending below the middle of the eye.. *P. koilomatodon.*

B. Eyes very small, about 10 times in the head; interorbital space broad, flat, more than an eye diameter; maxillary extending beyond eye .... *P. dasyrhynchus.*

DISTRIBUTION OF THE SPECIES OF PRIONOBUTIS

PRIONOBUTIS KOILOMATODON Bleeker.

This species occurs in both fresh and salt water throughout the Philippines, but probably never goes up streams beyond the influence of the tides. It occurs in the East Indies from Celebes and Amboina to Java and is found also at Singapore, Pinang, and the Andaman Islands. It ranges north from the Philippines to the coast of China.

PRIONOBUTIS DASYRHYNCHUS Günther.

This eleotrid is only known from the coast of Sarawak, Borneo, but may well occur in the south-western part of the Philippines.

11. Genus ODONTOBUTIS Bleeker

This genus is separated from *Butis* by its more numerous scales, the increased number of dorsal spines, and the slight development of the smooth and naked bony crests of the head. The head is acute, depressed, each jaw with a few rows of slender teeth; no canines.

Apparently there is but a single species.

ODONTOBUTIS OBSCURA (Schlegel).

Dorsal VII or VIII–I–8; anal I–6 or 7; scales in a lateral series 36 to 46, usually about 40.

The entire body is covered with scales except the space between the eyes and tip of the snout, the lips, eyes, and chin.

The color of preserved specimens is dark brown, with bluntly angled darker crossbands along the sides; all the fins are more or less cross barred with brown and pale spots.

This fish was originally described from Japan, where it is common in estuaries and river mouths. It occurs also in Korea and south along the coast of China to Hong Kong. It has been taken at Zamboanga, and no doubt occurs in river mouths and estuaries throughout the Visayan Islands and Luzon. It has been reported also from Java.

It is a good food fish, reaching a length of 175 mm or more.

12. Genus ODONTELEOTRIS Gill

This genus contains two species, one of which lives in estuaries and mouths of large rivers in Bengal and Burma, and is therefore out of the territory included in this paper. The other is known thus far only from Madura and Java, in the Indies. There are 80 to 100 cycloid scales in a lateral series. The depressed head is densely scaled above and on the sides. The mouth is large, oblique, with prominent lower jaw and two or four prominent curved canines in the upper jaw. Dorsal VI–I–9 to 11; anal I–8 or 9.

ODONTELEOTRIS CANINA Bleeker.

Bleeker had only three specimens from the Straits of Madura, near Kammal, Madura, and from Surabaya, Java. No doubt this fish also occurs in Borneo and should be looked for in the river mouths of Balabac, Palawan, and Mindanao.

13. Genus LIZETTEA Herre

This large robust eleotrid has about 55 ctenoid scales in a longitudinal series, with about 36 predorsal scales. The head is very large and depressed, with projecting lower jaw and very deep caudal peduncle. Dorsal IV or V–I–7; anal I–7. The reduced number of dorsal spines is the outstanding character. Only one species is known.

LIZETTEA PELEWENSIS Herre.

The fins are low, the first dorsal noticeably so. The top and sides of the head are elaborately marked by rows of minute foliose papillæ. The sole specimen is a female 219 mm long, caught in a fresh-water stream in the Pelew Islands. This fish may occur in streams emptying into the Pacific along the coasts of Mindanao, Samar, and Luzon.

14. Genus PALOA Herre

Two species of this interesting genus are known. They are both confined to the Philippines. Dorsal V–I–10 (9 to 12); anal I–8 or 9; scales all cycloid, 85 to 100 in lateral series, 55 to 65 predorsal. Vertical fins are all low, dorsals far apart, the second dorsal and anal much higher than the first dorsal. Eyes noticeably small.

Key to the species of Paloa

A. Scales in longitudinal series 88 to 92; 10 rays in second dorsal; eye more than 10 times in head. A blackish brown stripe from tip of snout above eye to caudal base; a second stripe from eye to middle of caudal base; a third band from pectoral axil to caudal base; no rodlike papillæ on chin under lower jaw........................... *P. polylepis.*

AA. Scales in longitudinal series about 100; rays in second dorsal, 9; eye 7.5 times in head; a blackish stripe from snout across eye to caudal base and one from pectoral axil to caudal base; rod-shaped papillæ on chin under lower jaw .... *P. villadolidi.*

PALOA POLYLEPIS Herre.

This strongly differentiated fish is only known from Panay. It is sometimes seen in the Iloilo market, and occurs also in Antique Province. It reaches a length of about 100 mm.

PALOA VILLADOLIDI Roxas and Ablan.

This species was described from Dagupan, Pangasinan Province, and as yet is not known elsewhere.

15. Genus POGONELEOTRIS Bleeker

This genus is unique among the Eleotridæ because of its many short filaments and fringes on the snout and cheeks. Scales ctenoid; the small accessory scales mixed in with the large ones is a character shared with *Butis butis*. Eyes small to minute and widely separated. Two species are known.

Key to the East Indian species of Pogoneleotris

A. Dorsal VI–I–13; anal I–10 .... *P. heterolepis.*
B. Dorsal VI–I–8; anal I–8 .... *P. microps.*

CHARACTERS AND DISTRIBUTION OF THE SPECIES OF POGONELEOTRIS

POGONELEOTRIS HETEROLEPIS (Günther).

The broad depressed head is covered with minute scales. The eyes are minute, far apart. Teeth very small, in bands; an outer row of larger teeth in the upper jaw; an outer and inner row of larger teeth in the lower jaw. Only known from Sarawak, Borneo. Reaches a length of 175 mm. After Günther.

POGONELEOTRIS MICROPS M. Weber.

Each scale has 5 small basal scales; all are ctenoid. The eye is 11 times in the head, and 4.4 times in the width of the interorbital. The inner row of teeth is little larger than the rest. Lives in the rivers of both the north and south halves of Dutch New Guinea. Length 230 mm. After Weber.

16. Genus BORODA Herre

Four species are known thus far, three from the Philippines and one from the Sepik River, New Guinea. The New Guinea species is a valuable food fish.

Key to the species of Boroda

A. Predorsal scales 50 or more; lateral scales 62 to 68; eye 8.25 to 11 times in head .... *B. malua.*

AA. Predorsal scales less than 50; lateral scales 50 to 60; eye less than 6 in head.
  B. Transverse scales 17 to 20.
    C. Transverse scales 17 or 18; predorsal scales 32 to 34; lateral scales 50 to 52; head 3 to 3.2 times in length; eye 5.2 to 5.5 in head .... *P. albo-oculata.*
    CC. Transverse scales 20; predorsal scales about 42; lateral scales about 60; head 2.4 to 2.7 times in length; eye 4.8 to 5.8 in head .... *B. expatria.*
  BB. Transverse scales 14; predorsal scales 36 to 40; lateral scales about 52; head 2.9 to 3.1 in length; eye 4.3 to 4.5 in head.... *B. francoi.*

DISTRIBUTION OF THE SPECIES OF BORODA

BORODA MALUA Herre.

Only known from the Sepik River, New Guinea. A bulky fish reaching a length of a third of a meter or more.

BORODA ALBO-OCULATA Herre.

A Philippine species occurring in streams in Palawan, Culion, and Busuanga, and in the sea at Nasugbu, Luzon. No doubt occurs in Mindoro. Attains a length of 125 mm or more.

BORODA EXPATRIA Herre.

Occurs in streams and lakes in northern Palawan. It reaches a length of 150 mm.

BORODA FRANCOI Roxas and Ablan.

As yet only collected from the Dagupan River, Pangasinan Province, Luzon.

17. Genus BUNAKA Herre

Large thick-bodied eleotrids living in rivers near the sea. One species is only known from Mindanao, but the other two are not so restricted in their range. One is known from Sumatra and Celebes, but the other ranges all over the Philippines, south into British North Borneo, and eastward through Micronesia.

Key to the species of Bunaka

A. Body uniform brown on back and sides, with dark longitudinal lines along the rows of scales. Lateral series of scales 56 to 60; scales in transverse series 16 to 18 (19).
  B. Depth 5.75 to 6, the head 4 times in the length; eye 5 to 5.5 times in the head and equal to, or a little less than interorbital space. *B. gyrinoides.*
  BB. Depth 4 to 4.6, the head 2.8 to 3 times in the length; eye 6.5 to 7.5 times in head and 1.75 or more than twice in the interorbital width .... *B. pinguis.*
AA. Head, sides, and under parts spotted with large irregular pale blotches and circular spots; scales 52, in transverse series 20 to 21. *B. sticta.*

DISTRIBUTION OF THE SPECIES OF BUNAKA

BUNAKA GYRINOIDES (Bleeker).

Described by Bleeker from Sumatra and from Celebes.

BUNAKA PINGUIS Herre.

Largest of the Philippine gobies, reaching a length of about a fourth of a meter, and occurring all over Luzon and southward to Mindanao and Tawi Tawi. This is a good food fish.

I have taken it also at Tawau, on the east coast of British North Borneo, and in the Pelew Islands. Specimens were also sent me from Kusaie, one of the eastern Caroline Islands.

BUNAKA STICTA Herre.

Only known from the Tagaloan River, Misamis Oriental Province, Mindanao. The single specimen known measured 210 mm.

18. Genus OPHIOCARA Gill

The body is robust, more or less rounded anteriorly, with flattened sides toward the tail. The smooth head is broad and flattened, densely scaled, the scales on top of the head enlarged. The scales of the body are ctenoid, with from 28 to 40 in a lateral series. The mouth is large, oblique, the lower jaw prominent; there are 6 to 10 rows of small teeth in each jaw, those of the outer row in each jaw enlarged; there are no canines. Dorsal VI–I–8 or 9; anal I–7 to 9.

Numerous species have been described, mostly based on growth stages, color phases, sexual differences, and other variations. An examination of thousands of specimens over most of the range of the species, living and freshly caught fish, as well as museum specimens, together with the observation of aquarium specimens over a decade, forces me to reduce our species to two. Fishes of this group are desirable food fishes.

Key to the Philippine and East Indian species of Ophiocara

A. Scales about 30 in lateral series; 2 dark diagonal bands from eye to opercle; 13 to 17 predorsal scales; only 2 pores on edge of preopercle, rarely conspicuous .... *O. aporos.*

AA. 35 to 40 lateral scales; 22 to 26 predorsal scales; 5 preopercular scales, at least 3 of them conspicuous; no diagonal band from eye to opercle .... *O. porocephala.*

REMARKS UPON AND DISTRIBUTION OF PHILIPPINE AND EAST INDIAN SPECIES OF OPHIOCARA

OPHIOCARA APOROS Bleeker.

This brilliantly colored eleotrid is the handsomest fresh-water fish native to the Philippines. In life its dark green background with golden spots, often varied with red or orange, golden spots on the fins, and markings on the sides of green, violet, or lavender, make it a gorgeously colored fish. While the general pattern is the same, one scarcely finds two alike in details of ornamentation.

The *bañgañgay* is found in lowland streams and lakes throughout the Philippines, and sometimes in the sea. Elsewhere it occurs from Sumatra to New Guinea, Fiji, and the Caroline Islands.

It is an important food fish to the people along rivers and lakes in the interior of Luzon, Mindanao, New Guinea, and other large islands. It is taken in traps, *bobos*, and also with hook and line. It reaches a length of 300 mm, but Philippine specimens have not been seen over 225 mm.

OPHIOCARA POROCEPHALA (Cuv. and Val.).

This fish lacks the brilliant colors of the preceding. It is brown or greenish brown with four broad dusky crossbands over the back and rows of pearly spots along the side, a spot to each scale. Some have two broad pale or yellowish crossbands over the back and down the sides.

It is found throughout the Philippines and East Indies in both fresh and salt water, but is less abundant than *O. aporos*. It ranges from India and the Seychelles Islands to the Caroline Islands and Fiji. The largest specimen seen was 225 mm long, but larger examples have been reported.

19. Genus GIGANTOGOBIUS Fowler

This huge eleotrid, largest of the gobioid fishes, is only known from the Baram River, Sarawak, Borneo.

The body is thick, rounded, robust, with a very large depressed head and a broad depressed snout. The eye is superior and noticeably small. The vertical fins are all unusually low. The whole body, except the snout, jaws, and under side of the head, is covered with small cycloid scales; predorsal scales very small and crowded.

There is but one species known.

GIGANTOGOBIUS JORDANI Fowler.

The head is 3.25 in the length or 2.25 times in the trunk, the depth 3.7 in the length. The eye is 11.6 in the head, and is in the first third of the head length.

The color is dark brown, the fins barred with dark brown spots.

The largest specimen Fowler had was 660 mm long.

20. Genus OXYELEOTRIS Bleeker

Some of the species of this genus are among the largest of all the gobies, and all are esteemed as food. Most of the species are seen regularly in the fish markets of Borneo, Malaya, Thailand, and the villages of New Guinea.

This genus belongs with the other large and bulky eleotrids which are distinguished by the possession of a large, broad, depressed head with a prominent lower jaw. But unlike the rest of them, the head is pointed, with a narrow snout; the others all have a blunt head with rounded snout. Another characteristic feature of *Oxyeleotris* is that the scales are all ctenoid.

DISTRIBUTION OF THE PHILIPPINE AND EAST INDIAN SPECIES OF OXYELEOTRIS

OXYELEOTRIS MARMORATA (Bleeker).

This large handsome eleotrid is common near the sea in the estuaries and rivers of Sumatra, Malaya, Siam, and Borneo. It has been taken from Laguna de Bay, Luzon, and no doubt is in river mouths in Balabac, Palawan, Tawi Tawi, and Cotabato Province, Mindanao. It has been recorded from Celebes and Ternate. It is a thick-bodied bulky fish and one of the largest of gobies, reaching a length of 460 mm or more. It is a good food fish, well known in the markets of Borneo, where living specimens are often seen.

OXYELEOTRIS UROPHTHALMUS (Bleeker).

This attractive looking fish, readily recognized by the ocellus on the caudal base, is often seen in the fish markets of Borneo, Malaya, Siam, and Sumatra, and occurs eastward to Celebes and New Guinea. It has not yet been taken in the Philippines but may well occur in the rivers of the south coast of Mindanao and in Balabac and Palawan. The var. *novæ guineæ* Koumans is only known from the Lorentz River, New Guinea. This fish reaches a length of about 200 mm.

OXYELEOTRIS UROPHTHALMOIDES (Bleeker).

This is another sharply differentiated fish, the spiny first branchiostegal making it easy to recognize. It is found in the lower part of the rivers of Borneo, Malay, and Sumatra and attains a length of 200 mm.

OXYELEOTRIS HETERODON M. Weber.

This large species is only known positively from fresh water in New Guinea. Several species described from Queensland, Australia, may belong here. It reaches a length of 425 mm.

OXYELEOTRIS FIMBRIATUS (M. Weber).

This species, which reaches a length of 300 mm, occurs in rivers and creeks in New Guinea, Waigiu, and the Aru Islands.

21. Genus HERREOLUS H. M. Smith

An interesting group of very small slender eleotrids thus far found only in Thailand and in the Philippines. The ventrals have but three rays and a spine. The naked body is almost translucent, giving one the curious impression of being able to look right through them.

Two species are known. Though apparently rare, I believe that they are comparatively common, but their mode of life protects them from observation. Their favorite abode is around and within the mass of hydroids, sponges, soft coral, tunicates, and algæ which cover piling, wharf timbers, floating logs, rocks, and other exposed surfaces, as well as in coral heads. They never venture far from their protected abode, and scurry back into hiding at the slightest alarm.

Key to the species of Herreolus

A. Second dorsal I–13 to 16; anal I–12 to 15; a broad black stripe extends from the lower jaw across the eye to the caudal tip.... *H. formosus.*
AA. Second dorsal I–18; anal I–17 or 18; no longitudinal stripe, but a black spot nearly equal to eye on caudal peduncle at the caudal base .... *H. philippinus.*

DISTRIBUTION OF THE SPECIES OF HERREOLUS

HERREOLUS FORMOSUS H. M. Smith.

This pretty little fish was first known from the Gulf of Siam. In the Philippines it may be seen darting out from under the growth covering piling and wharf timbers at Cebu, Dumaguete, and elsewhere in the Visayas and the coast of Mindanao. By using a long-handled dip net I have taken it at Dumaguete and at Port Holland, on the coast of Basilan. They never venture far from their protected home, and though many are seen it is very difficult to get any.

HERREOLUS PHILIPPINUS Herre.

Thus far this species is only known from Santa Maria, Zamboanga Province, Mindanao. They were observed swimming about under a large log raft in front of the saw mill at Santa Maria. They swam about in small schools, never going far from between the logs, but I was able to secure a few. No doubt they occur all around the Sulu Sea in suitable localities.

Neither species is known to exceed 30 mm in length, and most of them are 20 to 25 mm long.

22. Genus ANDAMELEOTRIS Herre

Dorsal VI–I–15 to 17; anal I–15 to 18; ventral I–3. The cycloid scales are 75 to 100 in longitudinal and 20 to 24 in transverse series.

Head naked, snout very short, mouth nearly vertical. The caudal maybe bluntly rounded, truncate, or forked.

Very small fishes related to *Ptereleotris*. Two species are known, one from the Andaman Islands and one from the Philippines. Their lengths are from 15 to 25 mm.

Key to the sepcies of Andameleotris

A. Uniform brown with black circular spot on lower half of caudal; other fins unmarked; caudal bluntly rounded.............................. *A. palustris.*

Known only from a nipa swamp near Zamboanga, Mindanao, Philippines.

AA. Tan, with a darker band from axil to caudal; a circular reddish black spot on caudal base; dorsal and anal spotted; caudal with reddish longitudinal band above and below; caudal truncate or more or less forked .... *A. raoi.*

Only known from the Andaman Islands in the Indian Ocean.

23. Genus EVIOTA Jenkins

Their peculiar long narrow and more or less sickle-shaped ventrals with fringed rays, together with their minute size, serve to set apart the fishes of this group and make it an easy one to recognize. The head and body are naked as far back as the first dorsal. The large eyes are much longer than the snout. Dorsal VI–I–8 to 10; anal I–7 to 9; ventral I–4.

Some species of this genus are among the smallest living backboned animals. Owing to their habit of life and their minute size they are little known. They live in the intricate crevices of coral where they cannot be obtained by ordinary means. The best way of getting them is to get coral masses by diving, then break up the coral heads over a canvas, so the tiny fish will not be lost.

The members of this genus are abundant in the coral reefs of Polynesia and range through the East Indies and Philippines north to southern Japan. A dozen or more species are known, but only three are known from the Philippines.

Key to the Philippine and East Indian species of Eviota

A. Scales 22 in lateral series; 8 dark bands on dorsal and ventral surfaces of body .... *E. sealei.*

AA. Scales more than 22.

 B. Scales 24; two circular black spots on pectoral base; the first 2 dorsal rays elongate and threadlike .... *E. distigma.*

 BB. Scales 25; 8 dark spots along side........................ *E. gymnocephalus.*

DISTRIBUTION OF PHILIPPINE AND EAST INDIAN SPECIES OF EVIOTA

EVIOTA SEALEI Herre.

This tiny species is known from Puerto Galera, Mindoro, from Dumaguete, Busuanga, Culion, and Bongao, Sulu Province. It occurs, no doubt, on coral reefs throughout the Philippines. Specimens seen were 12 to 17 mm in length.

EVIOTA DISTIGMA Jordan and Seale.

The two-spot *Eviota* is widespread in Polynesia and has been taken in the East Indies and at Dumaguete. It is so small and hides in coral so successfully that it is not easily found but is probably as common in the Philippines as Seale's *Eviota.* The two-spot *Eviota* is from 12 to 18 mm in length.

EVIOTA GYMNOCEPHALUS Weber.

Weber's *Eviota* is widespread in the East Indies and has been taken near Tawi Tawi, Sulu Province. It reaches a length of 25 mm.

24. Genus LUZONELEOTRIS Herre

This dwarf *Eleotris* seems to be allied to *Pterculiops* and *Orthostomus.* Only one species known.

LUZONELEOTRIS NASUGBUA Herre.

Scales cycloid anteriorly, ctenoid behind tip of pectoral, 48 to 50 in longitudinal series, sides of head and nape scaled. Dorsal VI–I–12; anal I–10; ventral I–5. Gill opening very wide, extending forward beneath middle of eye. Tongue truncate. Caudal with a rounded point, a little longer than the head. Body slender, elongate, compressed, the rather small head depressed anteriorly. The eye is half again as long as the snout.

Only known from a female specimen 24 mm long, ready to spawn, taken from a tide pool at Nasugbu, Batangas Province, Luzon.

25. Genus VALENCIENNEA Bleeker

This genus contains five or six species of slender, elongate, handsome, agile reef fishes of the Philippines, East Indies, and tropical Indo-Pacific in general.

Dorsal VI–I–11 to 18; anal I–12 to 17; ventrals I–5; scales ctenoid, 70 to 110 in a longitudinal series. First dorsal higher than second dorsal, the spines in some species elongate with threadlike tips.

This group includes some of the most beautiful of the eleotrids.

Key to the Indo-Pacific species of Valenciennea

A. Scales in lateral series more than 100.

  B. Second dorsal and anal with 16 to 18 rays. Scales 105; a pearly blue band from the angle of the mouth below the eye to the opercle; caudal bluntly rounded .... *V. strigata.*

  BB. Second dorsal and anal with 11 to 14 rays.

    C. Scales about 130; caudal obtusely rounded, with two rays nearest the 3 middle ones elongated and threadlike.......... *V. helsdingeni.*

    CC. Scales 105 to 110; five large ocellated spots on the side; no caudal rays prolonged and threadlike .... *V. longipinnis.*

AA. Scales 90 or less.

    D. Scales 80 to 90; teeth in upper jaw in one row; maxillary extending to the front margin of the eye or slightly beyond; sides of head with 3 or 4 longitudinal roseate bands; 2 or 3 similar bands on upper half of trunk, with sometimes vertical red bands crossing them at right angles.......... *V. muralis.*

    DD. Scales 75 to 85; teeth in upper jaw in 2 rows; maxillary reaching below the middle of the eye or beyond; 6 (5 to 9) violet ocelli or spots on sides of head.......... *V. sexguttata.*

DISTRIBUTION OF THE SPECIES OF VALENCIENNEA

VALENCIENNEA STRIGATA (Broussonet).

This trim beautiful fish occurs throughout the East Indies and Philippines, but the only published Philippine records are from Sorsogon Province, Luzon, and Dumaguete. It is abundant in the Caroline and Marshall Islands, and ranges to Tahiti. It reaches a length of 150 mm. The band across the cheek is very distinctive.

VALENCIENNEA HELSDINGENI Bleeker.

This lovely fish was only known from Goram, in the East Indies, until recently, when Dr. J. L. B. Smith figured and described it from Delagoa Bay, South Africa.

VALENCIENNEA LONGIPINNIS (Bennett).

This is another eleotrid of great beauty. It was first described from the Riu Kiu Islands. In the Philippines it is known from Siquijor Island, the coast of Leyte, and the Sulu Islands. Elsewhere it occurs from Celebes to the Fiji Islands. It reaches a length of 140 mm or more.

VALENCIENNEA MURALIS (Quoy and Gaimard).

This is the commonest and most widespread member of the genus. It is abundant in the Philippines, from Luzon to Balabac, Sitankai, and Davao. It is common from India and Ceylon through the East Indies to Australia, Fiji, and the Caroline Islands, and ranges north to Japan. Attains a length of 125 mm.

VALENCIENNEA SEXGUTTATA Bleeker.

This pretty little fish ranges through the East Indies and the Visayan Islands and probably occurs on reefs throughout the Philippines. It occurs in Polynesia as far as Samoa, where it is common. It reaches a length of about 125 mm.

26. Genus PTEROCULIOPS Fowler

This genus is related to *Valenciennea,* having two pairs of canines in the upper jaw and one pair in the lower, but differs in having larger scales; these are finely ctenoid, about 64 in lateral and 19 in a transverse series; predorsal scales 15 to 20, the head otherwise naked. Mouth large, extending below the eye; tip of tongue rounded. Dorsal VI–I–11; anal I–12; ventral I–5. Ventrals very long, longer than the head. Head and body with many rounded, blue-gray spots variable in size, more or less ringed with darker brown. Only one species is known.

PTEROCULIOPS GUTTATUS Fowler.

Only the type, 69 mm long, is known. It was taken at Port Banalakan, Marinduque.

27. Genus AMBLYELEOTRIS Bleeker

The anterior scales are cycloid, those on the posterior half ctenoid, 75 to 85 in a longitudinal series. The blunt head is naked, without predorsal scales. The dorsals are close together; dorsal and anal rays 12 or 13; ventral I–5. Three pairs of canines in the lower jaw.

AMBLYELEOTRIS PERIOPHTHALMUS Bleeker.

This is a rare species, only known from two specimens. Bleeker had one of 75 mm, taken at Batavia, now Djakarta, Java. Dr. Weber took one of 45 mm at Nusa Laut, in the

Molukkas. This fish should be looked for on the south coast of Mindanao, and in the Sulu Islands, as these localities have practically all marine fishes occurring in the Molukkas and on the coast of Celebes.

28. Genus **Nemateleotris** Fowler

Dorsal VI–I–28; anal I–24; ventral I–5; first dorsal spine prolonged into a thread reaching to the base of the last dorsal ray. Scales 100 to 110, plus 10 more on caudal base. Eye large, 3 times in head, much longer than snout. Teeth strong, in a single row about 20 in each jaw.

Only one species is known.

NEMATELEOTRIS MAGNIFICUS Fowler.

Known from a single specimen 61 mm long, taken at Buka Buka Island, Gulf of Tomini, Celebes.

29. Genus **PARVIPARMA** Herre

Body elongate, subcylindrical, the dorsal and ventral profiles nearly straight and parallel. Body covered with minute cycloid scales, more or less embedded, and 165 in lateral and 40 in transverse series; minute scales on pectoral and caudal fins and on nape above opercle; rest of head naked, the cheeks with crisscross lines of papillæ. Mouth nearly vertical with several rows of minute teeth behind an outer row of larger conical teeth; a pair of canines behind other teeth on each side of median line in upper jaw; lower jaw has 4 large coarse teeth on each side of the symphysis. Dorsal VI–I–10; anal I–10; ventral I–5; vertical fins all low; caudal rounded, equal to head. Only one species is known. It occurs in fresh and brackish water.

PARVIPARMA STRAMINEA Herre.

This Philippine eleotrid, which reaches a length of 85 mm, has been taken at Aparri, on the north coast of Luzon, and from the Saug River, on the south coast of Cotabato Province, Mindanao.

30. Genus **PTERELEOTRIS** Gill

This readily recognized genus contains only four species, all living in the waters of the western Pacific. It is the only genus with the ventrals I–4 which has a lunate caudal.

The members of this genus have been called pelagic because they have been taken while swimming at the surface. As a matter of fact various gobioid and blenniid fishes leave their haunts on the bottom and come to the surface at night, returning afterward to their homes below unless carried away by strong tidal currents. They are in no true sense pelagic fishes.

Key to the western Pacific species of Ptereleotris

A. Dorsal and anals rays 24 to 25.
  B. No black spot on lower part of caudal base .... *P. dispersus.*
  BB. A black spot on lower part of caudal base........................ *B. evides.*
AA. Dorsal and anal rays 28 or more.
  C. Dorsal and anal rays 28 to 29; pectoral base with oblong blackish spot; caudal without a black spot or band.............. *P. microlepis.*
  CC. Dorsal and anal rays 30 to 32; no blackish spot on pectoral base; central part of caudal black.................................. *P. heteroptera.*

DISTRIBUTION OF THE SPECIES OF PTERELEOTRIS

PTERELEOTRIS DISPERSUS Herre.

This Philippine species occurs from the Batanes Islands in the extreme north to the south coast of Mindanao. Not known elsewhere. It gets to be more than 80 mm long.

PTERELEOTRIS EVIDES Jordan and Hubbs.

This species, originally described from Japan, ranges to the New Hebrides. It reaches a length of 55 mm or more.

PTERELEOTRIS MICROLEPIS (Bleeker) Gill.

This eleotrid was first described from Nias and Banda Neira, islands in the East Indies. It is also known from Zanzibar, off the East Coast of Africa. It attains a length of 120 mm. It may well occur in the Sulu Archipelago and along the south coast of Mindanao.

PTERELEOTRIS HETEROPTERA Bleeker.

This is only known from a single specimen 49 mm long, taken at Bandjermasin, Borneo.

31. Genus POGONOCULIUS Fowler

This genus is separated at once from all other eleotrids in the Oriental tropics by the presence of a barbel on the middle of the chin under its tip. Dorsal VI–I–27; anal I–25; ventral I–4. The body is elongate, greatly compressed, the head small and short. The mouth is nearly vertical, with 10 large conical teeth in each jaw. Caudal truncate. The minute scales are only distinct on the tail. Ventrals equal to head and much longer than the pectorals. But one species is known.

POGONOCULIUS ZEBRA Fowler.

A single specimen 95 mm long was collected at Dasol Bay, Pangasinan Province, Luzon. The color was brown, with numerous narrow pale brown crossbands, narrower than the dark interspaces; there were 21 crossbands on the type specimen.

31. Genus VIREOSA Jordan and Snyder

The greatly elongate compressed body is covered with minute cycloid scales, separated and partly embedded; head naked, eyes large, more than the snout. A long flat barbel on chin, followed by three smaller ones. Dorsal VI–I–24; anal I–24; ventral I–4. Gill openings wide, extending forward below. Caudal long, the upper and lower rays extended in long, ribbon-like filaments. Only one species is known.

VIREOSA HANAE Jordan and Snyder.

This marine eleotrid is only known positively from Japan. It reaches a length of 130 mm. It may well occur in the Batanes Islands.

33. Genus ORTHOSTOMUS Kner

The body is elongate and compressed, the blunt head truncate, the small ctenoid scales extending forward to the eyes. The mouth is nearly vertical, with strong curved canines in both jaws. There are 25 to 30 rays in both the second dorsal and anal. The caudal fin is bluntly convex. Only one species is known.

ORTHOSTOMUS AMBLYOPINUS Kner.

Only one specimen, about 65 mm long, is known. It was taken at Singapore. This fish should occur along the China Sea coasts of Balabac, Palawan, and the Calamianes.

34. Genus OXYMETOPON Bleeker

This unique genus contains but a single known species. There are 100 to 110 ctenoid scales in a lateral series, but they fall off so freely that the fish may appear to be naked. There are 30 to 32 dorsal and anal rays. The elongate caudal fin has its central rays prolonged and threadlike. Other notable characters are the greatly compressed body, the height of the crest or keel before the dorsal, the 4 curved canines in the upper jaw and the two post symphysial canines in the lower jaw, and the 4 rays of the ventral.

OXYMETOPON TYPUS Bleeker.

The only specimen on record is one 159 mm long, taken at Kupang, Timor. It was rose-colored, with two diagonal blue streaks on the cheek, three or four blue longitudinal lines on the dorsal fins, a violet anal fin, and bluish ocelli on the caudal.

This lovely fish no doubt occurs in other parts of the East Indies and may well be in the Philippines in the Sea of Celebes.